



U.S. Department of Energy
Energy Efficiency and Renewable Energy

Energy Conservation Standards for Commercial Unitary Air Conditioners and Heat Pumps

ANOPR Public Meeting

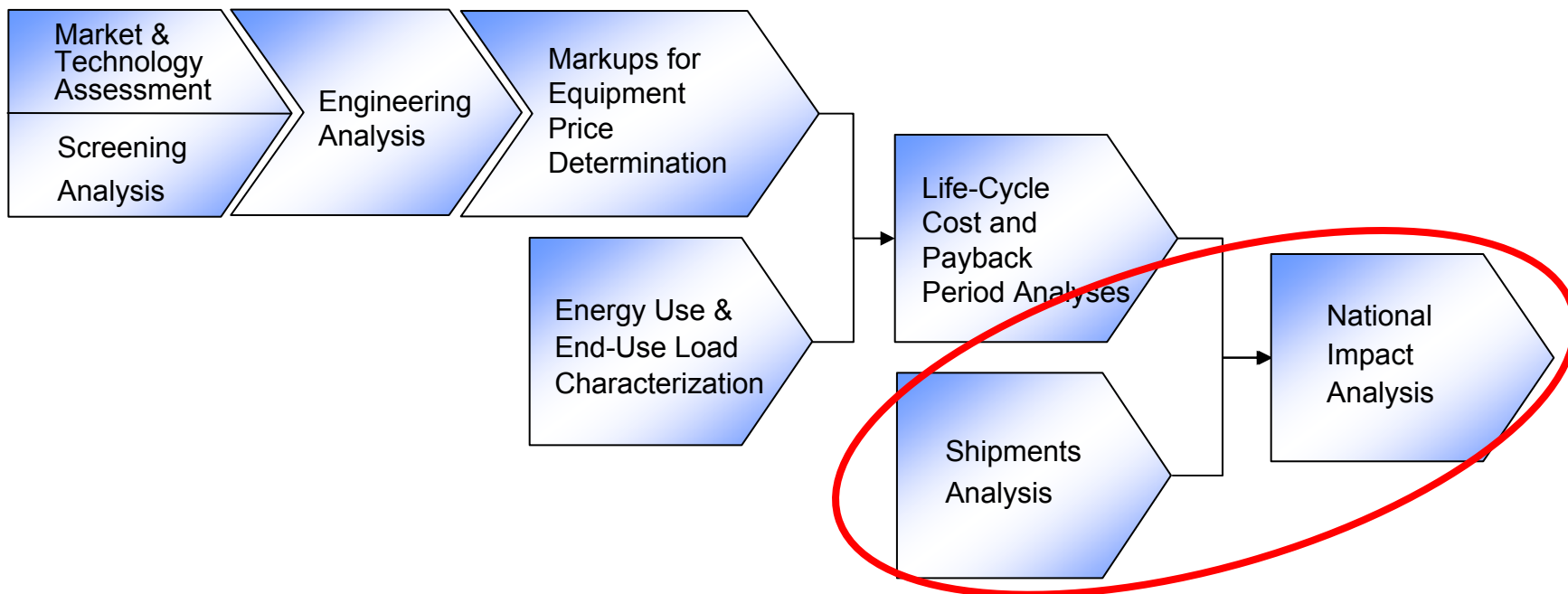
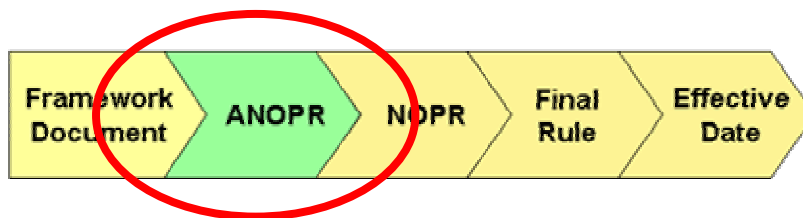
National Impact Analysis

**Building Technologies Program
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy**

September 30, 2004



ANOPR Analyses Flow Diagram





Purpose

■ National Impact Analysis

- To estimate the National Energy Savings (NES) from higher efficiency standards levels.
- To estimate the national economic impact on the nation (or the Net Present Value (NPV)) from higher efficiency standards levels.

■ Shipments Analysis

- To estimate commercial unitary air conditioner shipments over time.

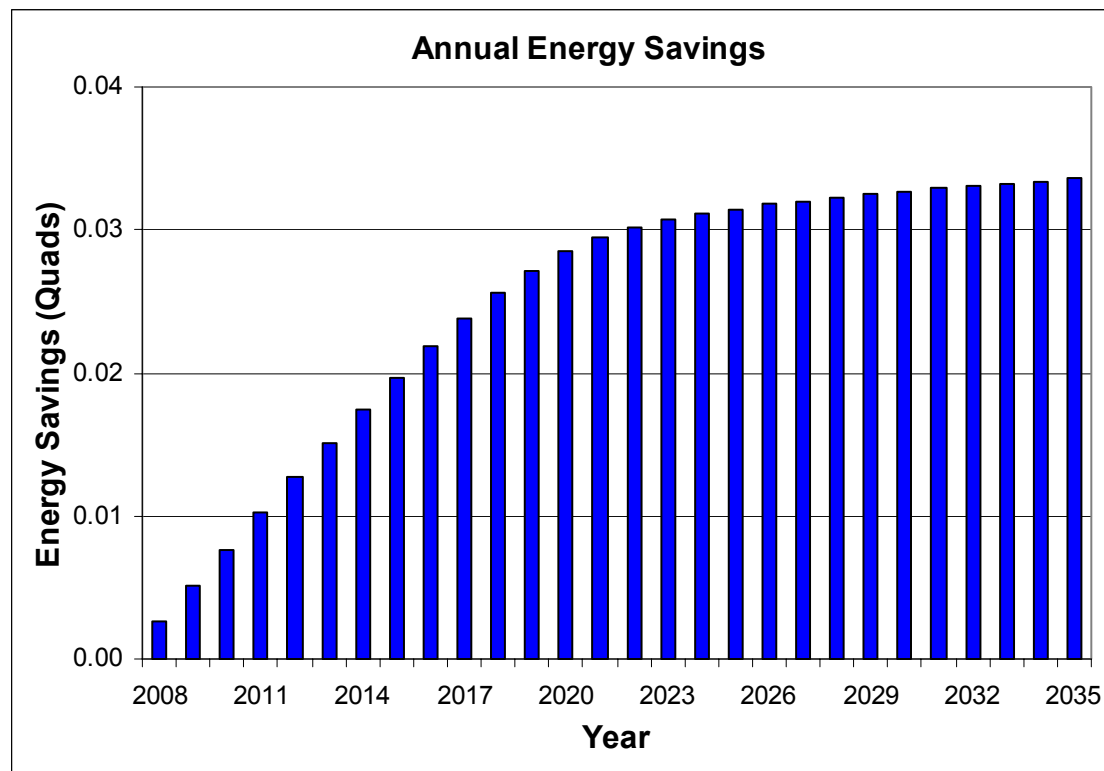


ANOPR Issues for Public Comment

- **Candidate Standards Levels (ANOPR Issue #3)**
- **Effective Date of New Standards and Phaseout Date of R-22 Refrigerant (ANOPR Issue #15)**
- **Maximum Market Share of Commercial Unitary Air-Conditioning Equipment (ANOPR Issue #12)**
- **Future Building Types using Commercial Unitary Air-Conditioning equipment (ANOPR Issue #13)**

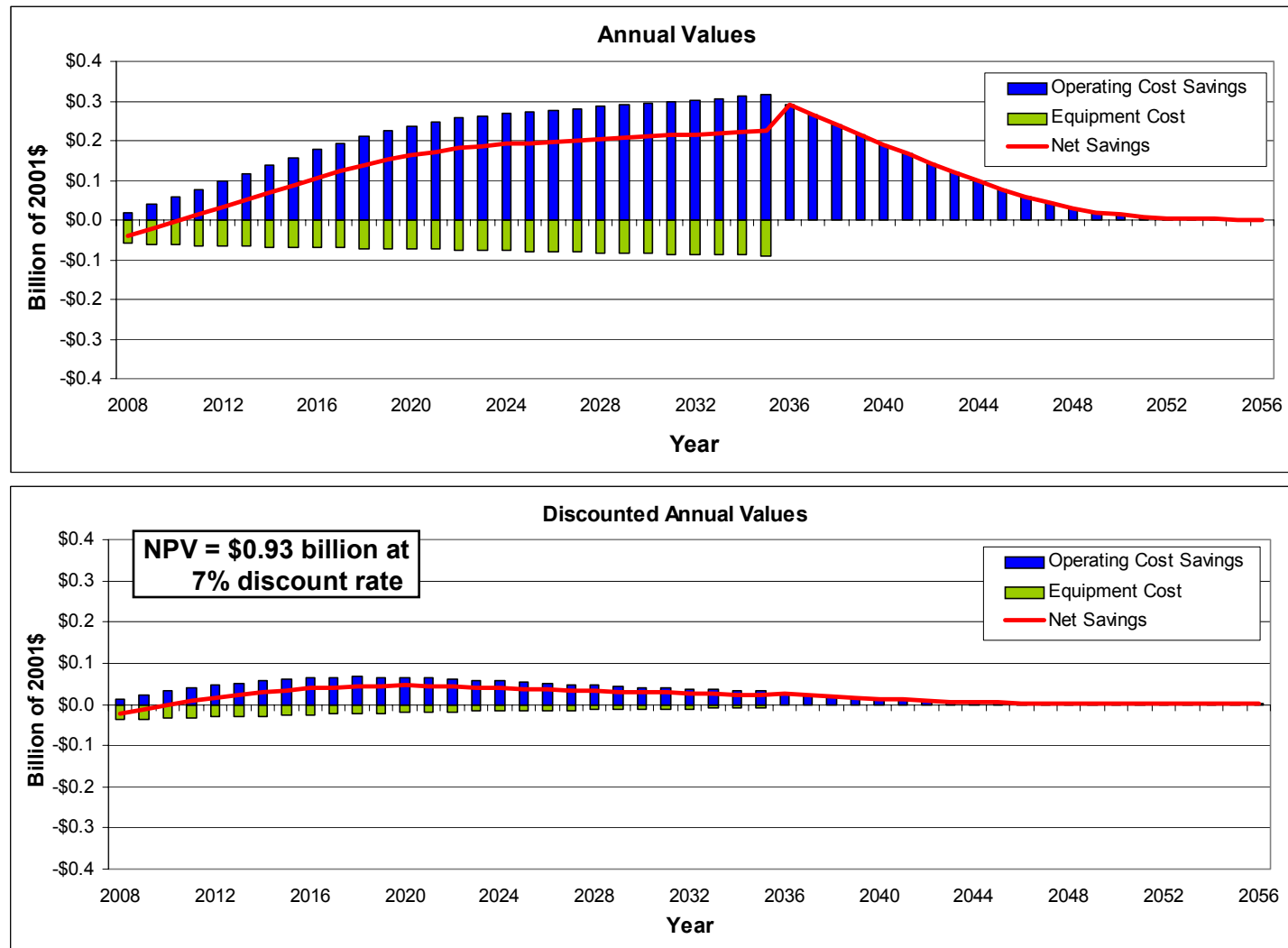


Example of National Energy Savings Results: $\geq 65,000$ Btu/h and $< 135,000$ Btu/h, 11.0 EER



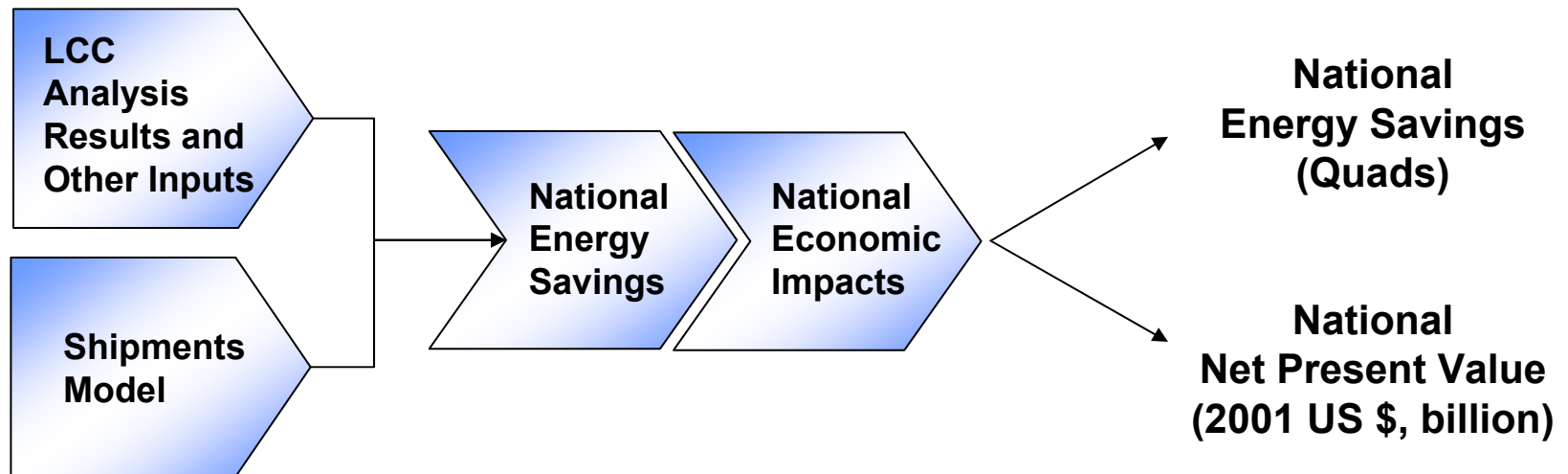


Example of Net Present Value Results: ≥65,000 Btu/h and <135,000 Btu/h, 11.0 EER





Process Flowchart





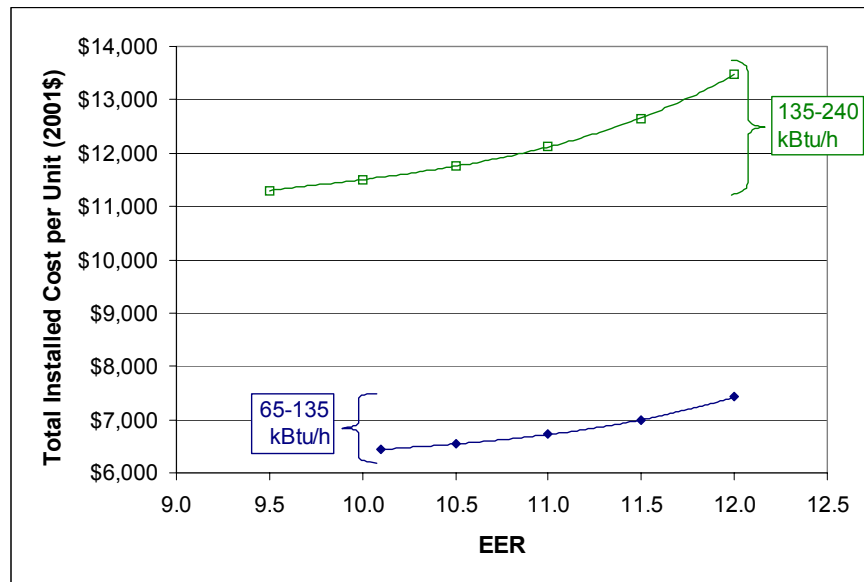
Inputs

- **Total Installed Cost**
 - Average per unit values as a function of efficiency level taken from LCC analysis
 - Future values are adjusted with efficiency trends
- **Repair and Maintenance Costs**
 - Average per unit values as a function of efficiency level taken from LCC analysis
 - Future values are adjusted with efficiency trends
- **Annual Energy Use**
 - Weighted-average per unit values as a function of efficiency level taken from LCC analysis
 - Future values are adjusted with efficiency trends
- **Efficiency Trends**
 - Developed for the base case (without standards) and each standards case
 - Future trends based upon historical shipment-weighted efficiency data for residential and commercial air-conditioning equipment from ARI
- **Energy Prices**
 - Weighted-average marginal prices taken from LCC analysis
 - Future marginal prices are adjusted according to trend forecasted by the *2003 Annual Energy Outlook*
- **Electricity Site-to-Source Conversion Factors**
 - Conversion factors forecasted by *2003 Annual Energy Outlook*
 - Factors vary annually and account for generation, distribution, and transmission losses
- **Discount Rate**
 - 7% and 3% real from OMB's Regulatory Analysis Guideline A-4
- **Present Year**
 - Future expenses are discounted to the year 2001

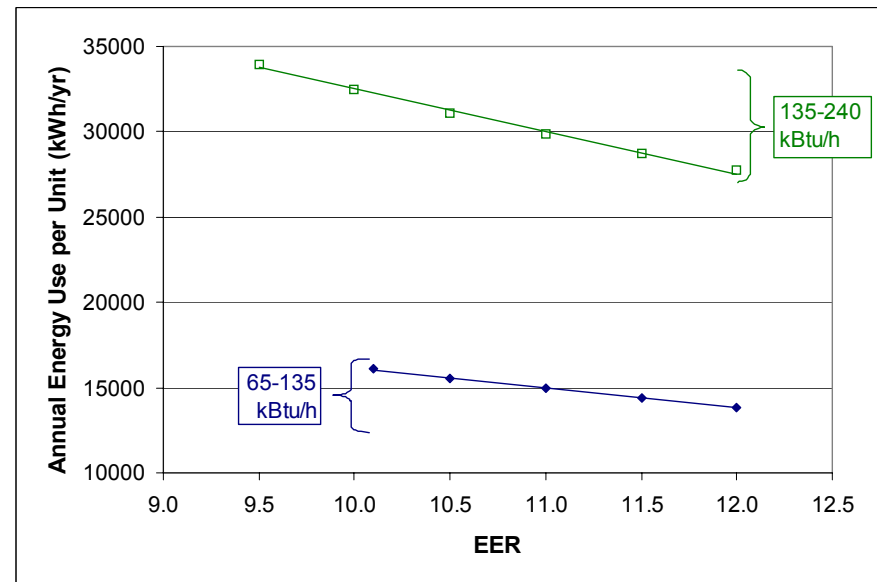


Input Examples to the National Impact Analysis: Per Unit Total Installed Costs and Annual Energy Use

Total Installed Cost



Annual Energy Use





Shipments Model

Input	Data Source/Description
Commercial Building Data	
Forecasted New Construction: 2001-2025	U.S. DOE-EIA, <i>2003 Annual Energy Outlook</i>
Historical New Construction: 1980-2000	U.S. Census Bureau, <i>Statistical Abstract of the United States: 2002</i>
Forecasted Stock: 2000-2025	U.S. DOE-EIA, <i>2003 Annual Energy Outlook</i>
Historical Stock: 1979-1999	U.S. DOE, <i>Commercial Building Energy Consumption Survey (CBECS)</i>
Market Saturation Data (percent of floor space with unitary a/c) and Replacements	
Historical Saturation: 1969-2000	U.S. Census Bureau, <i>Current Industrial Reports, Refrigeration, Air Conditioning, and Warm Air Heating Equipment</i>
Replacements driven by Equipment Lifetime	From Life-Cycle Cost Analysis (15 year median lifetime)
Purchase Decision Data	
Total Installed Cost, Annual Operating Cost	From Life-Cycle Cost Analysis
Business Income	Building Owners and Managers Association (BOMA) International, <i>Historical Experience Exchange Reports</i>
Calibration Data	
Historical Shipments	U.S. Census Bureau, <i>Current Industrial Reports, Refrigeration, Air Conditioning, and Warm Air Heating Equipment</i>



Maximum Saturation of Commercial Unitary Air-Conditioning Equipment (ANOPR Issue #12)

Saturation (or market penetration) is defined as the percent of commercial floor space that uses commercial unitary air-conditioning equipment in the range of 65 to 240 kBtu/h.

Historical shipments and market data indicate that the current market penetration is approximately 12 percent.

The shipments model estimates a maximum saturation of 20 percent (or approximately 10 percent for each equipment class).

The Department seeks comments on its estimate of 10 percent as the maximum saturation for each equipment class.



Future Building Types using Commercial Unitary Air-Conditioning Equipment (ANOPR Issue #13)

Future shipments depend in large part on growth in new commercial floor space. The average growth rate of new construction is provided by the *Annual Energy Outlook*.

The shipments model used the new construction growth rate without differentiating by building type. If new commercial unitary air conditioner shipments are preferentially installed in specific building types (e.g., retail or office), then the shipments forecasts may be altered.

For the purpose of forecasting equipment shipments, the Department seeks comments on whether growth rates of individual buildings should be used rather than average new construction growth rates.



Candidate Standards Levels (ANOPR Issue #3) and Effective Date of New Standards and Phaseout Date of R-22 Refrigerant (ANOPR Issue #15)

Candidate standard levels ranging from 10.0 to 12.0 EER have been analyzed. The Department has also analyzed as a candidate standard level the efficiency levels established by ASHRAE/IESNA Standard 90.1-1999.

The Department has identified possible alternative standards scenarios including: (1) an effective date for standards that is coincident with the phaseout of refrigerant R-22 and (2) a two-tier standard (i.e., a moderate increase in the efficiency standard with an early effective date followed by a more stringent standard effective at a later date).

The Department seeks comments on these standards scenarios.

The Department seeks comments on whether the effective date for standards should coincide with the phaseout of R-22.



Other National Impact Analysis Issues

The Department seeks comments and recommendations from stakeholders on any other aspects related to the National Impact Analysis.



Other ANOPR Issues

The Department seeks comments and recommendations from stakeholders on any other aspects of the Commercial Unitary Air Conditioner and Heat Pump ANOPR analyses.